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Description

estat acplot plots the estimated autocorrelation and autocovariance functions of a stationary process using the parameters of a previously fit parametric model.

estat acplot is available after arima and arfima; see [\[TS\] arima](#) and [\[TS\] arfima](#).

Quick start

Autocorrelation function using estimates from arima or arfima

```
estat acplot
```

Autocovariance function using estimates from arima or arfima

```
estat acplot, covariance
```

Same as above, and save results in mydata.dta

```
estat acplot, covariance saving(mydata)
```

Menu for estat

Statistics > Postestimation

Syntax

```
estat acplot [ , options ]
```

<i>options</i>	Description
saving (<i>filename</i> [, ...])	save results to <i>filename</i> ; save variables in double precision; save variables with prefix <i>stubname</i>
level (#)	set confidence level; default is level(95)
lags (#)	use # autocorrelations
covariance	calculate autocovariances; the default is to calculate autocorrelations
smemory	report short-memory ACF; only allowed after arfima
CI plot	
ciopts (<i>rcap_options</i>)	affect rendition of the confidence bands
Plot	
marker_options	change look of markers (color, size, etc.)
marker_label_options	add marker labels; change look or position
cline_options	affect rendition of the plotted points
Y axis, X axis, Titles, Legend, Overall	
twoway_options	any options other than by() documented in [G-3] twoway_options

Options

[saving](#)(*filename*[, *suboptions*]) creates a Stata data file (.dta file) consisting of the autocorrelation estimates, standard errors, and confidence bounds.

Five variables are saved: *lag* (lag number), *ac* (autocorrelation estimate), *se* (standard error), *ci_l* (lower confidence bound), and *ci_u* (upper confidence bound).

[double](#) specifies that the variables be saved as doubles, meaning 8-byte reals. By default, they are saved as floats, meaning 4-byte reals.

[name](#)(*stubname*) specifies that variables be saved with prefix *stubname*.

[replace](#) indicates that *filename* be overwritten if it exists.

[level](#)(#) specifies the confidence level, as a percentage, for confidence intervals. The default is level(95) or as set by [set level](#); see [\[R\]](#) [level](#).

[lags](#)(#) specifies the number of autocorrelations to calculate. The default is to use $\min\{\text{floor}(n/2) - 2, 40\}$, where $\text{floor}(n/2)$ is the greatest integer less than or equal to $n/2$ and n is the number of observations.

[covariance](#) specifies the calculation of autocovariances instead of the default autocorrelations.

[smemory](#) specifies that the ARFIMA fractional integration parameter be ignored. The computed autocorrelations are for the short-memory ARMA component of the model. This option is allowed only after [arfima](#).

CI plot

[ciopts](#)(*rcap_options*) affects the rendition of the confidence bands; see [\[G-3\]](#) [rcap_options](#).

Plot

marker_options affect the rendition of markers drawn at the plotted points, including their shape, size, color, and outline; see [G-3] [marker_options](#).

marker_label_options specify if and how the markers are to be labeled; see [G-3] [marker_label_options](#).

cline_options affect whether lines connect the plotted points and the rendition of those lines; see [G-3] [cline_options](#).

Y axis, X axis, Titles, Legend, Overall

twoway_options are any of the options documented in [G-3] [twoway_options](#), except by (). These include options for titling the graph (see [G-3] [title_options](#)) and for saving the graph to disk (see [G-3] [saving_option](#)).

Remarks and examples

The dependent variable evolves over time because of random shocks in the time domain representation. The autocovariances γ_j , $j \in \{0, 1, \dots, \infty\}$, of a covariance-stationary process y_t specify its variance and dependence structure, and the autocorrelations ρ_j , $j \in \{1, 2, \dots, \infty\}$, provide a scale-free measure of y_t 's dependence structure. The autocorrelation at lag j specifies whether realizations at time t and realizations at time $t - j$ are positively related, unrelated, or negatively related. `estat acplot` uses the estimated parameters of a parametric model to estimate and plot the autocorrelations and autocovariances of a stationary process.

► Example 1

In [example 1](#) of [\[TS\] arima](#), we fit an ARIMA(1,1,1) model of the US Wholesale Price Index (WPI) using quarterly data over the period 1960q1 through 1990q4.

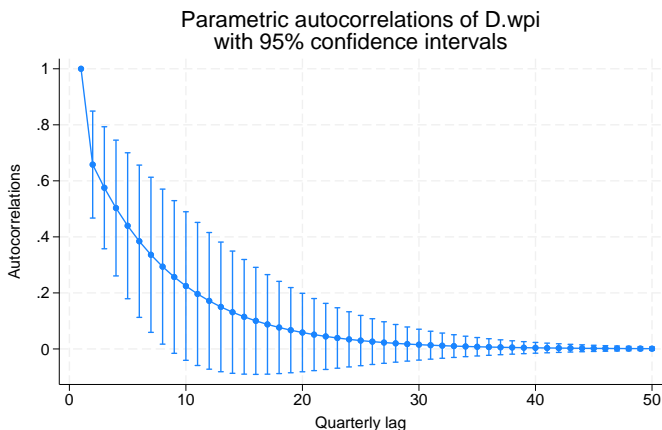
```
. use https://www.stata-press.com/data/r19/wpi1
. arima wpi, arima(1,1,1)
(setting optimization to BHHH)
Iteration 0:  Log likelihood = -139.80133
Iteration 1:  Log likelihood = -135.6278
Iteration 2:  Log likelihood = -135.41838
Iteration 3:  Log likelihood = -135.36691
Iteration 4:  Log likelihood = -135.35892
(switching optimization to BFGS)
Iteration 5:  Log likelihood = -135.35471
Iteration 6:  Log likelihood = -135.35135
Iteration 7:  Log likelihood = -135.35132
Iteration 8:  Log likelihood = -135.35131
ARIMA regression
Sample: 1960q2 thru 1990q4
Log likelihood = -135.3513
Number of obs      =      123
Wald chi2(2)       =     310.64
Prob > chi2        =      0.0000
```

D.wpi	OPG					
	Coefficient	std. err.	z	P> z	[95% conf. interval]	
wpi						
_cons	.7498197	.3340968	2.24	0.025	.0950019	1.404637
ARMA						
ar						
L1.	.8742288	.0545435	16.03	0.000	.7673256	.981132
ma						
L1.	-.4120458	.1000284	-4.12	0.000	-.6080979	-.2159938
/sigma	.7250436	.0368065	19.70	0.000	.6529042	.7971829

Note: The test of the variance against zero is one sided, and the two-sided confidence interval is truncated at zero.

Now we use `estat acplot` to estimate the autocorrelations implied by the estimated ARMA parameters. We include `lags(50)` to indicate that autocorrelations be computed for 50 lags. By default, a 95% confidence interval is provided for each autocorrelation.

```
. estat acplot, lags(50)
```



The graph is similar to a typical autocorrelation function of an AR(1) process with a positive coefficient. The autocorrelations of a stationary AR(1) process decay exponentially toward zero.

◀

Methods and formulas

The autocovariance function for ARFIMA models is described in [Methods and formulas](#) of [\[TS\] arfima](#). The autocovariance function for ARIMA models is obtained by setting the fractional difference parameter to zero.

[Box et al. \(2016\)](#) provide excellent descriptions of the autocovariance function for ARIMA and seasonal ARIMA models. [Palma \(2007\)](#) provides an excellent summary of the autocovariance function for ARFIMA models.

References

- Box, G. E. P., G. M. Jenkins, G. C. Reinsel, and G. M. Ljung. 2016. *Time Series Analysis: Forecasting and Control*. 5th ed. Hoboken, NJ: Wiley.
- Palma, W. 2007. *Long-Memory Time Series: Theory and Methods*. Hoboken, NJ: Wiley.

Also see

[\[TS\] arfima](#) — Autoregressive fractionally integrated moving-average models

[\[TS\] arima](#) — ARIMA, ARMAX, and other dynamic regression models

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